THE

Water we Drink.

GIVING AN ACCOUNT OF

THE IMPURITIES TO WHICH IT IS LIABLE,

AND THE

BEST METHODS OF REMOVING THEM.

GATE CITY STONE FILTER CO.,

14 East Fourteenth Street,

NEW YORK.

PRICE LIST

OF

FILTERS AND COOLERS COMPLETE,

READY FOR USE.

No. 7,	will filter	2	gallons	in	24	hours	.....	$8 00
No. 8,	"	"	4	"	"	24	"	..... 10 00
No. 9,	"	"	5	"	"	24	"	..... 12 00
No. 10,	"	"	6	"	"	24	"	..... 16 00
No. 11,	"	"	8	"	"	24	"	..... 18 00
No. 12,	"	"	10	"	"	24	"	..... 22 00
No. 13,	"	"	12	"	"	24	"	..... 24 00
No. 14,	"	"	14	"	"	24	"	..... 28 00
No. 16,	"	"	16	"	"	24	"	..... 32 00
No. 18,	"	"	20	"	"	24	"	..... 40 00

The cut on the other side represents the method of filtering; the bottom being an elegant water cooler.

FILTERS WITH PORCELAIN LINED COOLERS.

No. 7,	Porcelain	Lined	Cooler	and	Filter,	$12 00
No. 8,	"	"	"	"	"	14 00
No. 9,	"	"	"	"	"	18 00
No. 10,	"	"	"	"	"	22 00
No. 12,	"	"	"	"	"	25 00

FILTERS WITH ELEGANT OBELISK COOLERS.

No. 8,	Obelisk	Cooler	and	Filter.....	$22 00
No. 9,	"	"	"	.....	26 00
No. 10,	"	"	"	.....	28 00
No. 12,	"	"	"	.....	32 00

THE WATER WE DRINK

AND

HOW TO PURIFY IT.

THERE is no greater blessing than good water; men have lived without food for forty days, but no man ever abstained from water for more than nine days and survived. But while good water is a source of health and vigor, bad water is a prolific source of disease and death, and one of the very highest authorities on hygiene, Parkes, asserts that "this much seems to be certain, that as precise investigations proceed, and, indeed, in proportion to the care of the inquiry and the accuracy of the chemical examination, a continually increasing class of cases is found to be connected with the use of impure water."

It is not our intention to act the part of the alarmist in this matter; our purpose is rather to enlighten the public, not only in regard to the dangers which lie hid in what ought to be a universal beverage, but in regard to the best methods of avoiding these dangers.

Absolutely *pure water* is a myth; it cannot be found, even in the laboratory of the chemist. Distilled water comes very near being pure, but even that is not quite free from foreign matter. We shall therefore speak of "good" water, rather than of pure water, for water may be considered *good* when the impurities are small in quantity and of kinds that are not essentially hurtful.

The usual impurities of water are these:

I. Mineral Matter.—This may exist either in suspension or solution. It is said to be "in suspension" when it is not dissolved, but is diffused through the water in very fine powder. Clay and very fine sand are good examples of this impurity. Some of these substances are very easily removed, even by paper, sponge and sand filters, but in many cases, as, for example, the clays which defile the waters of the Mississippi, the Missouri, Rio Grande, etc., they defy all the filters in common use with a single exception. When mineral matter, as, for example, common salt, is dissolved in the water, it cannot be removed by any mechanical filter. A large bed of sand will remove some of it; but a filter of sand, to be efficient, must be so large as to be impracticable, and even that soon takes up all it can hold, after which it allows the water to carry through it all the salts without diminution. All spring and river water contains more or less matter in solution, but it is only when this is in excess that it becomes injurious.

II. Living Plants.—As a general rule it may be accepted that living plants are purifiers, rather than defilers of water. They absorb soluble matter and fix it in their tissues, and they give off immense quantities of oxygen, which is one of the most powerful purifying agents known. Water which is so impregnated with sewage as to be absolutely poisonous will, after it has remained in contact with a sufficient amount of living plants for some time, become quite pure and wholesome, and the beautiful desmids and diatoms which are so often pictured as evidences of impurity in water, are really nature's great regenerators. Of course there are certain marked exceptions to this. Some plants actually become parasitic when taken into the stomachs of animals; others give off acid, and perhaps poisonous excretions. Thus, some species of duck-weed are said to render bitter the water in which they grow. Plants are rarely found in good spring water, or water from deep wells, and, in all cases, the better the water the fewer the plants, for the presence of either plants or animals in water is a sure indication that they find food there, and consequently that matters are present which may be dangerous to human health.

III. Living Animals.—Of these the kinds that inhabit most river, pond, and even rain water, are almost innumerable. Some are so large that they are readily seen with the naked eye; others require microscopes of very high power to obtain even a glimpse of them. Very few of the so-called animalcules are *of themselves* dangerous to health, but as they are well known to be nature's scavengers, it is evident that wherever we find much animal life present in water, that water cannot be very good. From springs and good wells they are almost entirely absent, probably because they can find nothing to feed on. But whether dangerous or not, such creatures are very disgusting when found in food or drink, and people whose tastes and habits are not of the very lowest order will cheerfully take considerable trouble to get rid of them.

To the general statement that plants and animals are of themselves harmless, there are, however, two notable exceptions. These are what are known as Parasites or Entozoa, and Disease Germs. Entozoa are those animals that live in the bodies of other animals, not excepting man himself. The tape-worm, the trichina, the round worm and the pin-worm are well-known examples of human parasites, and there are many others which give rise to dangerous and painful diseases. Even some of the common insects, which in their ordinary state live upon plants, become parasitic in man when their eggs find their way by means of food or drink into the human body, and all the ablest authorities agree that one means by which the eggs of such parasites sometimes gain access to the human system is through drinking water which has been exposed to the open air—as in streams, ponds and reservoirs.

Disease Germs.—A still more dangerous impurity in drinking water are the so-called "Disease Germs." The best authorities hold that certain diseases, known as *Zymotic* diseases, are propagated or transmitted by a peculiar class of low organisms, which find their way into the system through the channels of air, food and water. Of these diseases Malarious Fevers, Typhoid Fever, Cholera, Scarlet Fever and Diphtheria are the most notable. Concerning these disease germs but

little is known, and consequently some have denied their existence altogether, but the accumulation of evidence has now become so great that the weight of authority is entirely on the side of attributing the transmission of these diseases to their agency.

IV. Dead Animal and Vegetable Matter.—This may exist either in solution or as solid debris. It is present in most kinds of water, except that from deep springs and wells. Even rain water contains notable quantities of such decaying matter, especially that which falls first, as this washes out of the atmosphere all the lighter particles of dust and filth which the winds have raised into the air, sometimes to very considerable heights. As the rapidity with which the particles of dust fall to the ground after being raised by winds depends upon their size and weight, it is evident that dried animal and vegetable tissues, ground to powder under the feet of animals and the wheels of vehicles, and baked in a hot sun, will be light compared with particles of sand and other minerals. Now, as these are the kinds of matter to which disease germs are most likely to adhere, it is evident that all surface water, that is to say, the water of streams, rivers and lakes, will contain the concentrated washings of the air over large areas, and during any epidemic of a Zymotic disease such water must be a very effective distributor of disease germs.

When animal and vegetable matters putrify in water, a large part becomes dissolved. This is particularly the case with sewage and other matters of that kind, but such conditions also exist wherever living animals and vegetables are present. Wherever there is life there is death. Not only do individual plants and animals die, leaving their remains to putrefy and defile the water, but living organisms give off excreta of various kinds and lead to the same result.

Effects of Impurities in Water.—The effects of impurities in water have been very carefully studied and are tolerably well understood.

The presence of fine mineral matter in suspension, however clean and free it may be from decomposing animal or vegetable matter, is well known to cause severe diarrhœa. So thoroughly is this understood at

the south and west that during the seasons in which the rivers are loaded with fine clay and sand great care is taken not to drink the waters except after careful purification.

The effect of sewage and of decaying animal and vegetable matter is too generally known to need more than mention. The most dangerous forms of typhoid fever have been traced directly to the contamination of drinking water by sewage, and although there is some dispute as to whether ordinary sewage can give rise to typhoid fever, or whether it requires to be contaminated with the evacuations of typhoid patients, yet there can be no dispute about the desirability of excluding all such matters from drinking water. This, however, is not always such an easy thing to do. If these evacuations are deposited upon the surface of the ground, dried, and then mixed with soil and broken up by the scratching of birds and other small animals, there is no telling where the winds may carry them. All open reservoirs, lakes and streams are in this way liable to contamination.

As already stated, the injurious effects of living animals and vegetables are rarely serious. It is only when these living organisms are parasitic in the human system, or when they are the specific agents of special diseases, that they are to be feared ; but it is astonishing how some organisms, that are usually quite scarce, multiply and render the drinking water of considerable areas offensive if not dangerous. The condition of the water in Boston, Rochester and some other places, a few years ago, furnished striking examples of this. It has even been found that such animals as very small leeches, quite unnoticeable by the ordinary observer, sometimes multiply to such an extent as to produce serious effects. Coughs, nausea and spitting of blood have been caused by very small leeches taken into the system in drinking water, and which attached themselves to the pharynx and neighboring parts. Four hundred men in the French army in Algiers were at one time in the hospital from this cause.

"In regard to the effect of impure water-supply in spreading cholera, physicians are not agreed. The opinion of Pettenkofer is against its occurrence, but in

India the evidence for cholera water-poisoning has now become very strong" (*Parkes*). The great cholera outbreak of 1860 and 1861 was attributed by the medical officers directly to the defilement of the water.

At Exeter, England, in 1832, 1,000 deaths occurred from cholera. A purer supply of water was then introduced from a locality two miles higher up the river, above the point at which it received the sewage of the town. When the cholera again invaded the city in 1849, only 44 cases occurred, and in the cholera season of 1854 there was hardly a case.

The famous Broad Street pump, in London, supplied water to the inhabitants of one of the most fashionable localities of the West End. During the visitation of cholera in 1848–49, this pump killed 500 persons in a single week by disseminating cholera. The wealthy people of the West End went to Brompton, a fashionable summer resort, about five miles up the Thames, and soon the cholera broke out amongst them there. The health officers soon discovered, on investigation, that these people had been in the habit of sending to the Broad Street pump for tea water, and had brought the cholera with it. A curious case was that of an old spinster, who had moved to Hampstead, three miles from the pump, but who sent her maid daily for a kettle of the highly-prized tea-water. She and her maid were the only persons who suffered from cholera at Hampstead.

Methods of Detecting Impurities.—The detection of impurities in water is at all times an easy matter in the hands of the experienced chemist, but as it takes both time and money to secure his services, a few words to the inexperienced reader may not be out of place. To those who have a practical knowledge of chemistry, and of the use of the microscope, there are several excellent works which give full information and instruction in regard to the subject, but in the hands of those who are not familiar with the use of scientific apparatus the senses are a far safer guide than any analytical tests.

The amount of suspended matter present in water can generally be estimated pretty accurately by the eye, provided it is not too transparent. The consumer

should never quibble about the *degree* of impurity, however. Whenever water shows the slightest signs of turbidity it should be filtered.

Very minute animals and plants are not easily seen with the naked eye by the inexperienced. On holding a tumbler of impure water up to the light against a clear sky, the living creatures will be seen as moving specks by a pair of sharp eyes.* But where no microscope is at hand, the most effectual means is to pass a beam of sunlight, or the electric light, through the bottle or jar containing the liquid. A speck of matter which is actually visible only under a high magnifying power, will so reflect light as to show its presence. In this way Tyndall tested the purity of the air in his tubes, and we have all seen clearly the most minute motes dancing in a sunbeam in air which, out of the beam of light, appeared perfectly pure.

The color of the water is not always a sure test of its purity, though it is not a bad guide in the case of water in its natural condition. It has been laid down as a rule by most water analysts that clear water of a bright bluish cast is generally pure ; water which is greenish generally contains vegetable matter, and water which is yellow or brownish is apt to be contaminated with animal matter, and, when taken in connection with other indications, these colors form no bad guide. The brownish waters from peaty deposits are, of course, contaminated largely with vegetable extractive matter, and in their original condition they are generally inhabited by very offensive animals. These, however, are easily removed by filtration, but the peaty color is not so readily got rid of by mere mechanical means. Fortunately, however, it is not by any means noxious.

Taste alone is not always a safe guide to an estimate of the purity of water. Of course, if the water has an offensive taste it should be at once condemned, but many waters that are sparkling and pleasant are quite dangerous, and habit has a great deal to do with our likes and dislikes as regards water. But contaminated water will be found to lose very rapidly its

* The reader must bear in mind that the fact that an organism moves about in the water is not evidence that it is an animal. Several undoubted plants (*Diatoms, Volvox Globator*, etc.) move about freely in the water.

pleasant character. If placed in a good-sized jar, which it about half fills, and kept in a warm place, it soon becomes offensive and shows the cloven foot very plainly. In tasting any water it is necessary that it be warm; ice-cold water of a very bad kind will pass as good with most people; but a water must be really very good to be palatable when the temperature is 90° F., and therefore this is the way to try it. Of course there are great differences in the keenness of perception of different persons in the matter of taste. Those whose organs have been dulled with tobacco, candy, rum, currie and similar articles, cannot tell good water from bad, and hence, perhaps, the small credit accorded to the sense of taste by modern writers on the subject.

The odor of water is also a very good test of its quality. To get the odor fully and fairly it is best to fill an ordinary quart glass fruit jar half full of the water, screw on the air-tight top, and leave the whole in a warm place for a few honrs. On opening the jar you will be able to get the full benefit of the odor. It is unnecessary to discriminate amongst "the several stinks" which impure water gives off. They are all bad, and water which, under such conditions, at the end of twelve or twenty-four hours has an offensive smell, ought to be condemned until purified.

HOW WATER MAY BE PURIFIED.

In attempting to purify water, we have two very distinct classes of impurities to deal with: 1. The substances that are dissolved in the water, and which may be either mineral or organic. 2. The insoluble particles, living and dead. These two classes require entirely different methods of treatment—that for the second being purely mechanical, while that for the first is chiefly chemical. When a sample of water contains an amount of soluble mineral matter which renders it unfit for use, there is no known method of purifying it. Attempts have been made, by means of large masses of sand, etc., to remove salt, lime, etc., from the water, but without success. It is true that we occasionally find in water certain soluble salts, which may be so changed, by the action of other salts, that they become insoluble, and may then be removed by a good mechanical filter. Such is the case with carbonate of lime

held in solution by carbonic acid, and lead held in solution in soft water. In the latter case a pinch of alum dissolved in the water will throw down the lead as sulphate of lead, which may then be filtered out and removed.

Soluble matter, of animal and vegetable origin, may be removed by proper means, but not by mechanical filtration. Oxygen is the great destroyer of these impurities, and they may be removed by exposing the water to the air in thin sheets, or by allowing it to drop very slowly from the filter. A small quantity of Condy's fluid (permanganate of potassa) is also a most efficient destroyer of organic matter, and a small quantity of alum added to water containing such impurities combines with them, renders them insoluble, and enables us to filter them out. The usual quantity of alum employed is about six grains to the gallon of water, but as it requires a previous determination of the proportion of organic matter present in the water, the use of these chemicals can hardly be recommended for popular use. And, unless the water is really very impure, if it is slowly passed through a good mechanical filter, and freely exposed to the air afterwards, there will be little danger in using it.

The coarser particles of suspended matter are easily removed from water by any common strainer. Sponge, paper, cloth, sand, or even fine wire gauze, will remove a great deal of the sand, animal and vegetable debris, and living plants and animals that render many samples of river and pond water impure; but where such crude filters are used, so many of the smaller particles pass through, that the purification is almost inappreciable, so far as health is concerned, for with the exception of a comparatively small number of species, it is not the larger plants and animalcules that are dangerous, but those that are so exceedingly small that very few filters can exclude them. As regards the most dangerous impurities of all—disease germs—nothing short of an efficient mechanical filter will serve to remove them. They cannot be killed by boiling under ordinary conditions, for the best authorities (Lex, Sanderson, Tyndall and others) place their death point as high as a temperature of 230° Fahrenheit- a temperature higher than that ever attained in culinary operations, where large proportions of water are used, such as the making of tea, coffee, ordinary soups, etc. This was

well shown in the case of the maiden lady who sent for tea-water to the Broad Street pump, in London, as related on a previous page. She, no doubt, used all this water for making tea, and boiled it well, and yet she was attacked by cholera under conditions which left no room for doubt that the water was the source from which she derived the disease.

In the "Manual of Practical Hygiene," prepared and published for the use of medical officers of the British army, and which undoubtedly stands amongst the very highest authorities on the subject, we find the following list of "the essentials of a good filter":

"1. That every part of the filter shall be easily got at, for the purpose of cleaning, or of renewing the medium.

"2. That the medium have a sufficiently purifying power, and be present in sufficient quantity.

"3. That the medium yield nothing to the water that may favor the growth of low forms of life.

"4. That the purifying power be reasonably lasting

"5. There shall be nothing in the construction of the filter itself that shall be capable of undergoing putrefaction, or yielding metallic or other impurities to the water

"6. The filtering material shall not be liable to clog, and that the delivery of water shall be reasonably rapid."

If the distinguished author had had one of the Gate City Stone Filters before him, and had formulated his rules so as to adapt them to its qualities and peculiarities, he could not have more fully described the actual good points of this filter. The filtering medium consists of a very close-grained natural sandstone, which allows water to pass with reasonable rapidity, but totally excludes all solid particles, however fine. Moreover, the grain is so fine that these impurities never penetrate the filtering stone itself, but lie on the surface, from which they may be removed by means of a cheap brush and a little water. Unlike filters of sponge, cotton, wool, and other organic materials, this stone never decays or putrifies. Those who have seen putrid sponge filters will appreciate this point. This stone is cut into slices and fitted into tanks of various sizes and different materials—glass, crockery, enameled ware, etc. The prices will be found on the second page of this pamphlet, and an engraving of a favorite form on the last page. It may be seen and examined at 14 East Fourteenth Street, New York.

DIRECTIONS FOR USING THE GATE CITY STONE FILTER.

Pass the water through the stone of a new filter four or five times before using it. Wash the stone with clean water every day, or oftener if the water is muddy. To remove any sediment that may adhere to the surface of the stone, use the brush gently. NEVER USE SOAP.

MADISON, Florida.

Messrs. McBride & Co.:

I sincerely recommend your Gate City Stone Filter. My family and myself *have all enjoyed better health* since using your Filter. I would not be without it.

MRS. M. A. FRALEIGH.

THE N. C. AGRICULTURAL EXPERIMENT STATION,
RALEIGH, N. C., Feb. 13, 1882.

Messrs. McBride & Co.:

The sample of unadulterated Atlanta water contained: Total solids in solution and suspension, 26.5 grains per gallon, of which volatile and organic matter was 15 grains per gallon, the rest being silica, oxides of iron, alumina.

Microscopical examination of the sediments—the water is teeming with organisms, chiefly algæ and diatoms.

Filtered through your Stone Filter, the water contains: Total solids in solution, 5 grains per gallon; volatile and organic matter, only a trace in the well dried residue; no chlorides or sulphates.

I detect no organisms under the microscope in this water after filtration. Respectfully,

CHAS. W. DABNEY, Jr. (State Chemist of N. C.)

NEW YORK, October 6, 1882.

We are using the Gate City Natural Stone Water Filter, * * * and cheerfully recommend it as a thorough Filter, and much more convenient than any we ever saw. WALLACE & SONS,

Brass and Copper Rolling Mill, 89 Chambers and 71 Reade Sts.

NEW YORK, August 22, 1882.

Messrs. McBride & Co., Atlanta, Ga.:

Gentlemen:—We take great pleasure in testifying to the efficiency of your Gate City Stone Filter. We have had it in use for three months, and find it all it is represented to be. No one, who desires pure water, should be without it. With the number of hands on our premises, we have found it of incalculable benefit, and feel sure that it has only to be made sufficiently known in order to become general in its application.

Yours very truly, L. STRAUSS & SONS,
42, 44, 46 Warren St., Importers of China, Pottery and Glassware, from all Countries.

Messrs. McBride & Co.: BOSTON, Mass.

Gentlemen:—We have studied somewhat carefully your Stone Filter Disc, and believe there is merit in it. Its simplicity is most attractive, and we have great confidence in its ability to do the needed work. We have adopted it, and, although we are geographically removed from the great centre of demand for the article, still we have no doubt but we shall sell quite a goodly number. Truly yours, DOVER STAMPING CO.

LOUISVILLE, Ky., August 21, 1882.

Messrs. Brinkley & Co.:

I have two of your "Gate City Natural Stone Water Filters" in use—one in the bank and the other at my residence. The medium through which the water passes causes it to be absolutely clear and pure. It is the best Filter I ever saw, and I would not be without it for many times its cost. THEODORE HARRIS,
Pres. Louisville Banking Co.

NEW ORLEANS, La.

The GATE CITY STONE FILTER is beyond all question the simplest, best and only Perfect Filter.

JOSEPH JONES, M. D., Pres. State Board of Health.

NEW ORLEANS, La.

The GATE CITY STONE FILTER is the best, simplest and only Perfect Filter I ever saw. E. A. BURKE,
Man. Ed. *Times-Democrat* and Director Gen'l World's Cotton Exposition.

LAW OFFICE OF B. F. REX, ST. LOUIS, MO.

Messrs. McBride & Co., Atlanta, Ga.:

I have investigated the claims of all the filters manufactured in this country or elsewhere, and believe your Gate City Stone Filter to be, *beyond any doubt, the best for family use in the world.* I have used it in my own family for years; it has done its work perfectly, and is as good to-day as when first used. Mississippi river water is disgusting to look at before it is filtered, but after passing through one of your Filters it becomes clear and beautiful to the eye, and as delicious to the taste as the best spring water. B. F. REX.

CHURCH OF THE GOOD SHEPHERD, PITTSBURG, Pa.

McBride & Co., Atlanta:

I have been using the "Gate City Stone Filter" for four years. It is the best Filter I ever saw.

D. C. PEABODY.

UNITED STATES LEGATION, BOGOTA, S. A.

Messrs. McBride & Co., Atlanta, Ga.:

I have used the Gate City Stone Filter, and find it perfect in every respect—it never clogs or becomes saturated with filth. It is indispensable, and will do everything you claim for it. WILLIAM L. SCRUGGS.

ATLANTA, Ga.

Messrs. McBride & Co.:

We have examined your Gate City Stone Filter, and have made practical experiments with it, applying some very severe tests, and pronounce it the best and most convenient filter we have ever seen for water or other fluids. CLAYTON & WEBB, Rectifiers.

Messrs. McBride & Co.: ATLANTA, Ga.

We have been using your Gate City Natural Stone Filter at our store to filter drinking water, and the water used in medical waters of the W. S. P., and find that it answers the purpose admirably. We think every druggist should have one, as in most cases the filter saves the trouble and expense of the distillation of water. It is superior to paper filters for tinctures or elixirs, and we would not be without it.

LAMAR, RANKIN & LAMAR.